What is claimed is:

1. A hetero-junction bipolar transistor, comprising:

a semiconductor substrate made of a first compound semiconductor material with a first band gap energy;

a collector layer made of a second compound semiconductor material with a second band gap energy, the collector layer having a plan shape defined by a first type of sides extending along [011] orientation, a second type of sides extending along [01-1] orientation and a third type of sides extending along [010] orientation shorter than the first type of sides and the second type of sides;

a base layer made of a third compound semiconductor material with a third band gap energy;

an emitter layer made of a fourth compound semiconductor material with a fourth band gap energy;

wherein the third band gap energy of the base layer is smaller than the second band gap energy and the fourth band gap energy.

2. The hetero-junction bipolar transistor according to claim 1, wherein the base layer further has a plan shape defined by a fourth type of sides extending along [011] orientation, a fifth type of sides extending along [01-1] orientation, a sixth type of sides extending along [010] orientation, and wherein a ratio of a length of the third type of sides of the collector layer to a length of the sixth type of sides of the base layer is greater than 0.9 and smaller than 1.5

3. The hetero-junction bipolar transistor according to claim 1, wherein the second semiconductor material and the fourth semiconductor material are InP, and the third semiconductor material is InGaAs.

4. A hetero-junction bipolar transistor, comprising:

a semiconductor substrate made of a first semiconductor material, the substrate having a first region and a second region on a primary surface;

a collector layer formed in the first region of the substrate and made of a second semiconductor material with a first band gap energy, the collector layer being defined by a first type of sides extending along [011] orientation, a second type of sides extending along [011] orientation and a third type of sides extending along [010] orientation;

a base layer formed in the second region of the substrate and made of a third semiconductor material with a second band gap energy smaller than the first band gap energy; and

an emitter layer made of fourth semiconductor material with a third band gap energy greater than the second band gap energy of the base layer, the emitter layer formed on the substrate,

wherein the second region is substantially same as the first region.

5. A method for producing a hetero-junction bipolar transistor having a collector layer, a base layer and an emitter layer on a semiconductor substrate, band gap energy of the base layer is smaller than band gap energy of the collector layer and the emitter layer, the method comprising

the steps of:

a) sequentially growing a first semiconductor film of the collector layer, a second semiconductor film of the base layer and a third semiconductor film of the emitter layer on the semiconductor substrate;

b) processing the third film to the emitter layer and the second film to the base layer by using a first mask;

c) forming a second mask on the first semiconductor film so as to cover the base layer and the emitter layer;

d) processing the first semiconductor film to the collector layer by using the second mask,

wherein the second mask is demarcated by a first type of edges extending along [011] orientation, a second type of edges extending along [01-1] orientation and a third type of edges extending along a predetermined orientation crossing one of the first type of edges and the second type of edges.

6. The method according to claim 5, wherein the predetermined axis extends along [010] orientation.

7. The method according to claim 5, wherein the predetermined axis extends along the other of the first type of edges and the second type of edges.

8. The method according to claim 5, further comprises a step of, preceding the processing of the third film to the emitter layer and the

second film to the base layer forming, forming the first mask on the third semiconductor film, wherein the first mask comprises a plurality of edges extending along directions different to [010] orientation.

9. The method according to claim 5, wherein the first film is made of InP and processed by a solution including hydrochloric acid at step d).